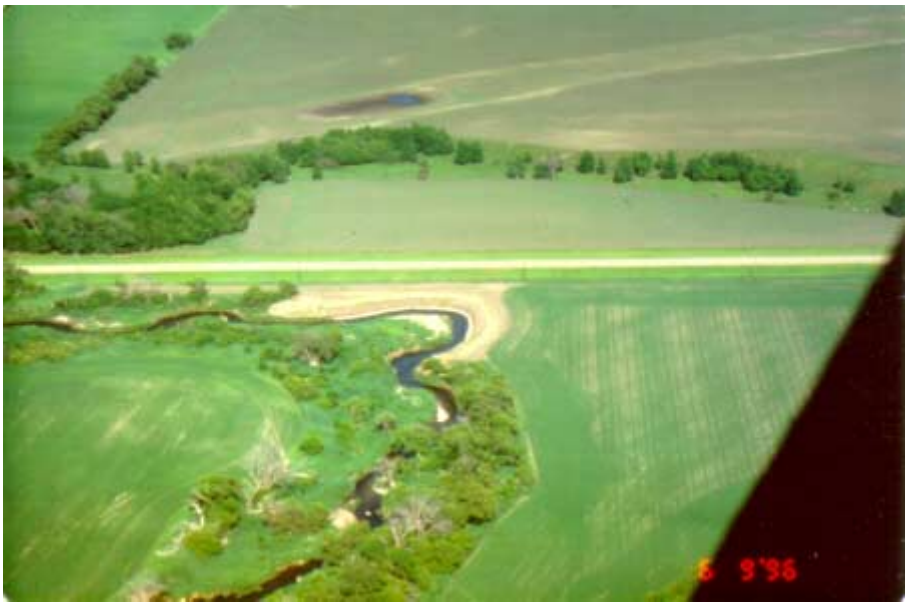
## Bioengineering Used to Stabilize Streambank Site on Turtle River

by Linda Kingery, Red River Basin Riparian Demonstration Project Coordinator

Over the past 50 years, a majority of the riparian areas in eastern North Dakota watersheds have been mismanaged and degraded by activities such as overgrazing, intensive agriculture, and indiscriminate logging. It is estimated that over 50 percent of the original forest cover in many watersheds in eastern North Dakota has been cleared for agricultural use. In addition, unmanaged grazing has damaged a significant portion of the remaining riparian forests. Overgrazing, in combination with the 1987-1990 drought, left many riparian areas in a weakened condition and susceptible to insects and diseases.

The Red River Basin Riparian Demonstration Project was initiated in 1994. The sponsor, the Red River RC&D Council, hopes to demonstrate various best management practices (BMPs) which can be used to restore and/or improve the condition of degraded riparian areas in North Dakota. The purposes of the information and education project include: 1) to demonstrate the effectiveness of various BMPs for restoring degraded riparian areas, and 2) to provide for the transfer of results, information, and technology to producers and natural resource professionals throughout the state.

The project's primary focus will include proper management of uplands adjacent to riparian areas, restoration and proper management of riparian buffer areas, and stabilization of stream banks.




*Aerial view of Turtle River riparian demonstration site*

One demonstration site, the Turtle River site, is located two miles north of the junction of US Highway 2 and Grand Forks County 2 or "as the crow flies," a mile east of Turtle River State Park. The area is prime farmland, and for the most part, a buffer of native bottomland hardwoods has been maintained. At the demonstration site, however, the lack of woody vegetation left the stream bank vulnerable to severe erosion. The situation

was compounded by groundwater seeps above the baseflow elevation of the river. During the period 1978 to 1995, the river migrated approximately 3.5 feet per year to the east until it was only 80 feet from the county road.

In order to stabilize the bank and stop further migration toward the road, several soil bioengineering techniques were implemented. The first step was to create a stable slope for the vegetation. The 14-foot vertical bank was reshaped to a 3:1 slope, with the waste from the top being used as fill at the toe. Then, riparian was installed along the toe to the bankfull elevation.

The actual installation of the soil bioengineering techniques took place during a training event in October 1995. The soil bioengineering team from Michigan's Natural Resource Conservation Service provided a 4-hour, indoor training session prior to the work on the river. About 70 resource managers from the Red River Basin attended. Plant materials specialist Dave Burgdorf explained the purpose of bioengineering techniques is to create a stable environment so native species can reestablish along the treatment area.

*Resource managers used bioengineering at the Turtle River site in 1995*

The participants then set to work installing a willow fascine in a trench just above the riprap. To make a fascine, willow branches 10 to 12 feet long were placed in a series of crossbucks to form a "rope" about 8 inches in diameter and 30 feet long. Twine ties were secured at 3-foot intervals along the fascine, which was then placed in the trench and secured with "stout stakes." Two wedge-shaped stout stakes were created by ripping a 2 x 4 board 24 inches long diagonally.

A brush mattress to physically armor the bank was installed by placing a grid of stout stakes in the bank at 2- to 3- foot intervals. After the bank was covered with branches, wire was placed over the brush mattress and wrapped around the stakes to form a network over the mattress. Then the stakes were driven into the bank. Finally, "live" stakes were placed throughout the brush mattress. The brush mattress and fascine were partially covered with soil so that some branches and buds would be exposed to light.

A native grass mix was planted above the brush mattress, and two rows of shrubs were planted to complete the project.

The high flows experienced in the spring of 1996 tested the site. Significant erosion occurred along the top of the riprap, uncovering and undermining the fascine. The soil was replaced and subsequently washed away during another period of high flow. The site was repaired again by Americorp volunteers in early June. The pictures taken in September 1996 show that the mattress and fascine sprouted prolifically.

Some of the lessons learned from experience at the Turtle River site include:

1) Soil/plant material contact is best provided by using water to place the soil over the brush mattress and fascine. Sponsors used a power washer to wash in the soil placed by backhoe.

2) The loose fill used at the toe was susceptible to erosion, especially in that first season. The site appears to have responded well to the repair work. Adding roughness to the toe would have helped. The use of root wads will be demonstrated at the Sheyenne River site.

3) Deer and beaver find the willow sprouts irresistible. It may be necessary to use repellants in some cases. At the Turtle River site, time will tell whether the utilization was too drastic for survival.

Riparian areas are crucial to the long-term protection and enhancement of the streams, rivers, and lakes in eastern North Dakota. Well-managed riparian zones help provide optimum food and habitat for stream communities, as well as serving as buffer strips for controlling nonpoint source pollution. Used as a component of an integrated management system (including nutrient management and erosion control), riparian buffers can greatly benefit the quality of the state's surface water resources.

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